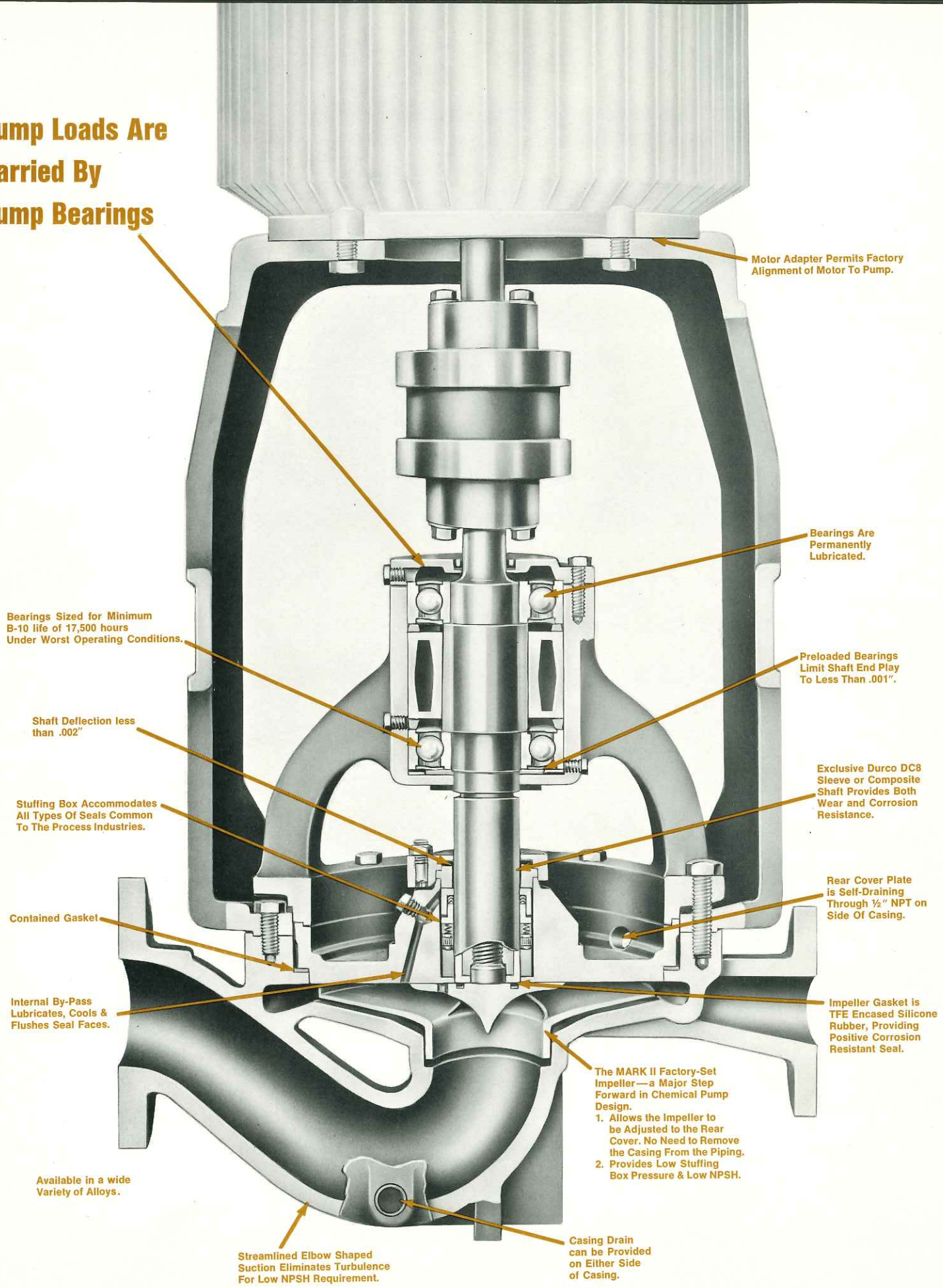
415
~~Digest 6~~
902

DURCO MARK II IN-LINE PUMPS

THE DURIRON COMPANY, INC., DAYTON, OHIO DURCO

Bulletin P-20-100b

Pump Loads Are Carried By Pump Bearings


Motor Adapter Permits Factory Alignment of Motor To Pump.
Bearings Are Permanently Lubricated.
Bearings Sized for Minimum B-10 life of 17,500 hours Under Worst Operating Conditions.
Preloaded Bearings Limit Shaft End Play To Less Than .001".
Shaft Deflection less than .002"
Exclusive Durco DC8 Sleeve or Composite Shaft Provides Both Wear and Corrosion Resistance.
Stuffing Box Accommodates All Types Of Seals Common To The Process Industries.
Rear Cover Plate is Self-Draining Through ½" NPT on Side Of Casing.
Contained Gasket
Internal By-Pass Lubricates, Cools & Flushes Seal Faces.
Impeller Gasket is TFE Encased Silicone Rubber, Providing Positive Corrosion Resistant Seal.
The MARK II Factory-Set Impeller—a Major Step Forward in Chemical Pump Design.
1. Allows the Impeller to be Adjusted to the Rear Cover. No Need to Remove the Casing From the Piping.
2. Provides Low Stuffing Box Pressure & Low NPSH.
Available in a wide Variety of Alloys.
Streamlined Elbow Shaped Suction Eliminates Turbulence For Low NPSH Requirement.
Casing Drain can be Provided on Either Side of Casing.

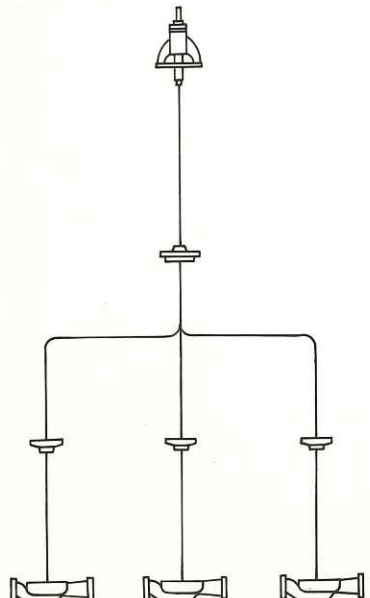
These pumps are manufactured under U.S. patent number 3,169,486 and other patents now pending.

ADVANTAGES OF MARK II IN-LINE PUMPS

- The only In-Line pump with its own bearing housing!
- The driver is an off-the-shelf motor with no special shaft, special bearings, or special tolerances.
- Shaft and stuffing box accept the full range of mechanical seals used in MARK II horizontal standard pumps. Seals, sleeves, packing, glands, and follower flanges are all fully interchangeable between MARK II In-Line and MARK II horizontal standard pumps.
- The MARK II impeller is fully interchangeable between In-Line and horizontal standard pumps.
- Low NPSH requirements.
- Low and predictable stuffing box pressures.
- Factory set impeller clearance to facilitate field replacement of seals.
- Factory aligned pump and motor.
- Long seal or packing life is assured by the MARK II bearing housing.
- Shaft deflection and run-out as low as the time-proven MARK II horizontal standard pumps.

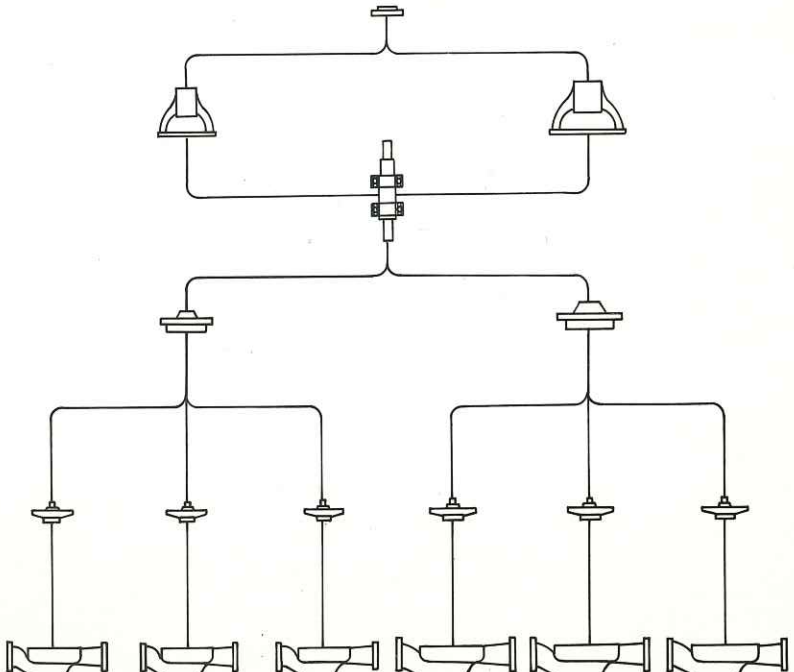
DURCO MARK II IN-LINE INTERCHANGEABILITY

GROUP I



2 x 1½V-6 2 x 1½V-8 3 x 2V-7

GROUP II



2 x 1½V-10 3 x 2V-10 4 x 3V-10 3 x 2V-13 4 x 3V-13 6 x 4VA-13

SEAL REPLACEMENT WITH THE DURCO MARK II IN-LINE PUMP IS QUICK AND EASY.

No Impeller Adjustment! No Alignment!

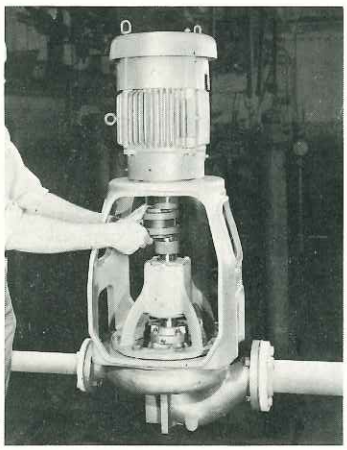


Figure 1

Figure 2

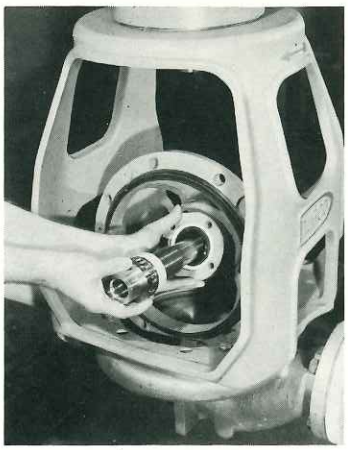


Figure 3

Figure 4

Simply withdraw the spacer from the coupling as shown in Figure 1. Then remove the casing bolts and retract the entire rotating assembly of the pump. The bearing housing can be cradled in the motor adapter as shown in Figure 2.

This position exposes the impeller and rear cover for further disassembly. The impeller is merely unscrewed from the shaft, and the rear cover plate is lifted off after removing the follower flange nuts and token bolts.

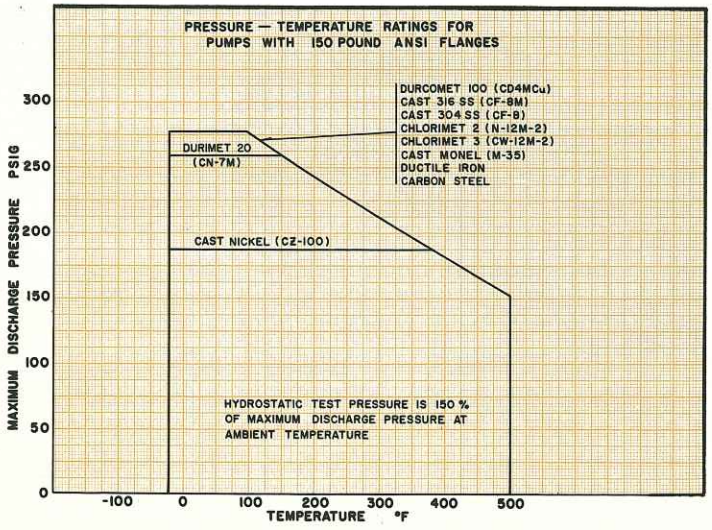
Having removed the rear cover, the seal is now fully exposed and can easily be replaced. Notice (Figure 3) that a removable hook-type sleeve may be used if desired.

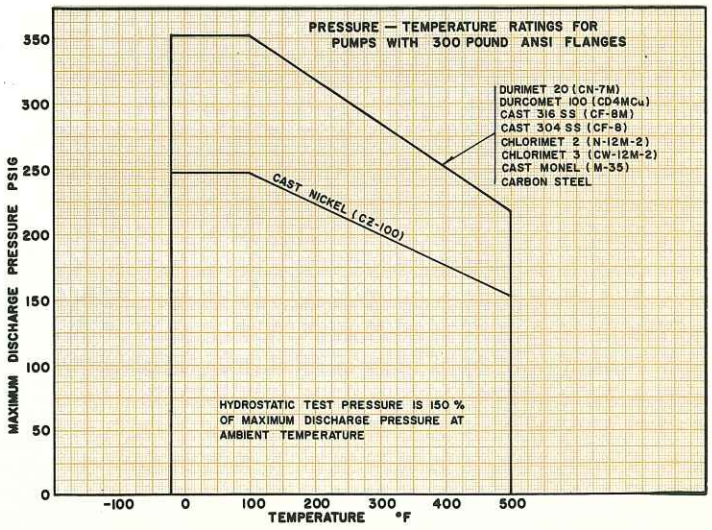
When the new seal has been installed, the rear cover and the impeller are reassembled and the rotating unit is piloted back into the motor adapter, re-establishing pump and motor shaft alignment.

Note that even if a new sleeve is installed, no impeller adjustment need be made! To return the pump to service, all that remains is to replace the coupling spacer. ***No alignment is required!***

MAXIMUM ALLOWABLE DISCHARGE PRESSURE:

It is necessary that both maximum allowable suction and discharge pressures be considered. The following charts show maximum allowable discharge pressure for pumps with 150# or 300# flanges.





Monel is a registered trade name of the International Nickel Company.

SHAFT DEFLECTION is the primary cause of mechanical seal failure.

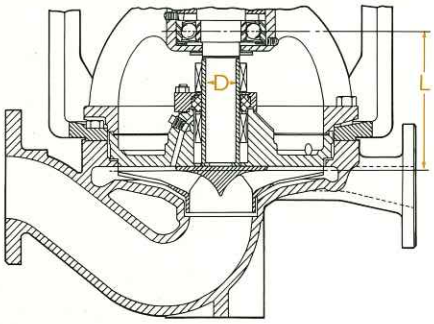
There are two broadly accepted design elements that critically effect the magnitude of shaft deflection. The more important of the two is the distance from the radial bearing to the center-line of the impeller, or the shaft overhang.

Shaft deflection is directly proportional to the cube of the shaft overhang.

The second major element in shaft deflection is the diameter of the shaft. Shaft deflection is inversely proportional to the diameter of the shaft raised to the fourth power. A seemingly small reduction in diameter can therefore result in a marked increase in deflection.

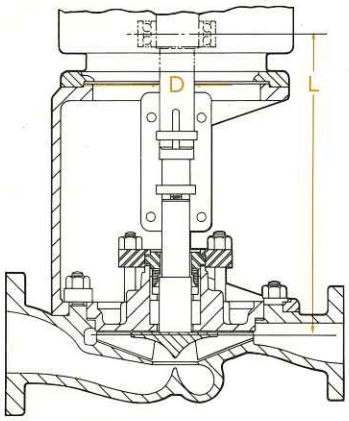
The table below provides a comparison of these critical dimensions of the Durco MARK II In-Line and other In-Line pump designs.

One method of combining both of the critical factors into a single comparable figure is the Index of Deflection which is arrived at by dividing the cube of the critical length by the fourth power of the diameter. This index is expressed $I = \frac{L^3}{D^4}$.



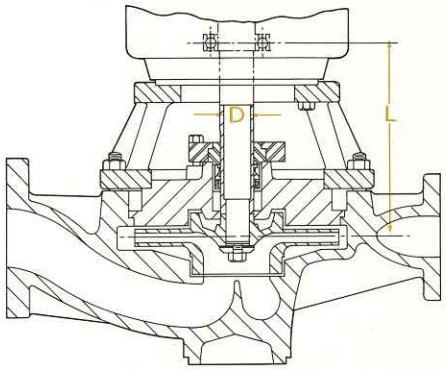
DURCO MARK II

Shaft Overhang 6.75
Shaft Diameter (sleeve design) 1.5
Index of Deflection 61



RIGID COUPLING DESIGN

Shaft Overhang ..... 14.5 to 18*
Shaft Diameter 1.625
Index of Deflection ..... 437 to 836



EXTENDED MOTOR SHAFT DESIGN

Shaft Overhang ..... 8.5 to 10.75*
Shaft Diameter 1.375
Index of Deflection ..... 172 to 348

*Varies with make of pump.

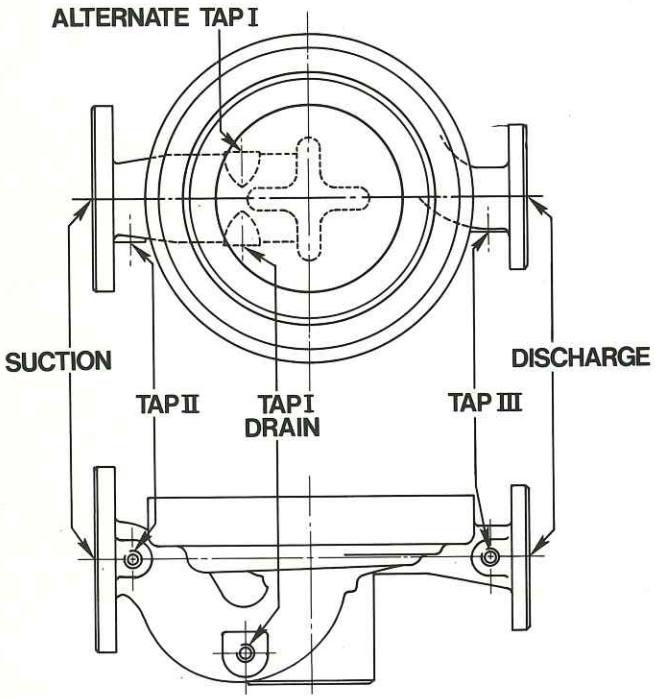
TECHNICAL DATA

	Group I	Group II
Bearing Size—Inboard and Outboard—MRC *	307 SFF/LO	310SFF/LO
Fafnir	P307KDD	P310KDD
Shaft Runout	<0.001" T.I.R.	<0.001" T.I.R.
Corrosion Allowance	1/8"	1/8"
Casing Flange Facing—150 lb. smooth flat face is standard. 300 lb. smooth flat face and 150 lb. and 300 lb. raised face also available.		
Impeller Setting (Cover Plate to Impeller)	0.018" Nominal	0.018" Nominal
Minimum Liquid Temperature Without Modification	−20°F.	−20°F.
Maximum Liquid Temp. Without Cooling	350°F.	350°F.
Maximum Liquid Temp. With Cooling	500°F.	500°F.
Maximum Allowable Horsepower (1150)	13	50
Maximum Allowable Horsepower (1750)	20	75
Maximum Allowable Horsepower (3500)	40	100
Maximum Allowable RMS Finish of Shaft at Stuffing Box	16	16
Jacket Rating	150 PSIG	150 PSIG

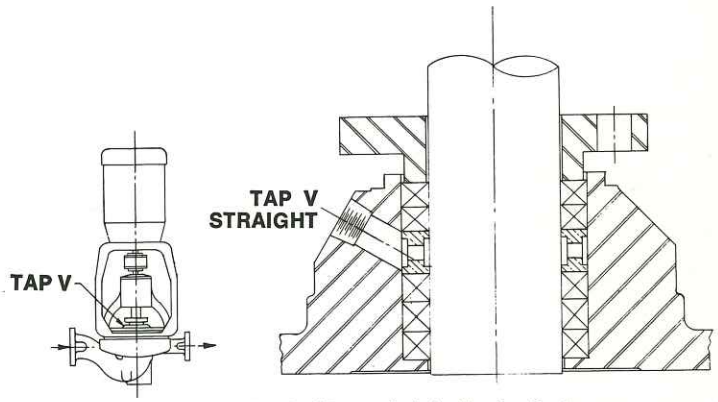
*Standard bearings for 6x4VA-13: I.B.-310R, O.B.-7310; optional bearings for all other: O.B. (Group I)—7307, O.B. (Group II)—7310.

STUFFING BOX ARRANGEMENTS

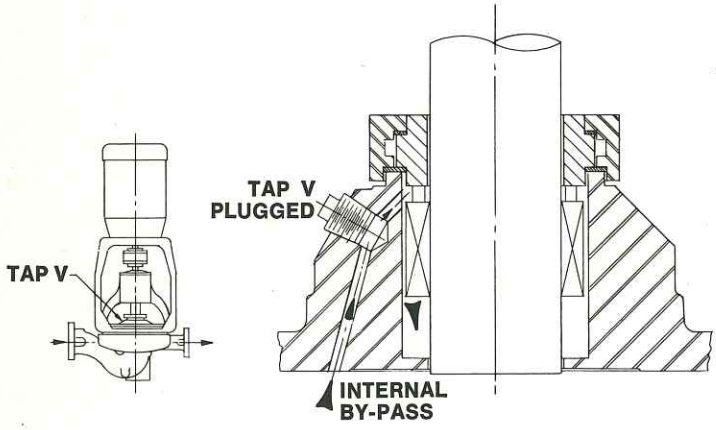
CASING TAP LOCATIONS



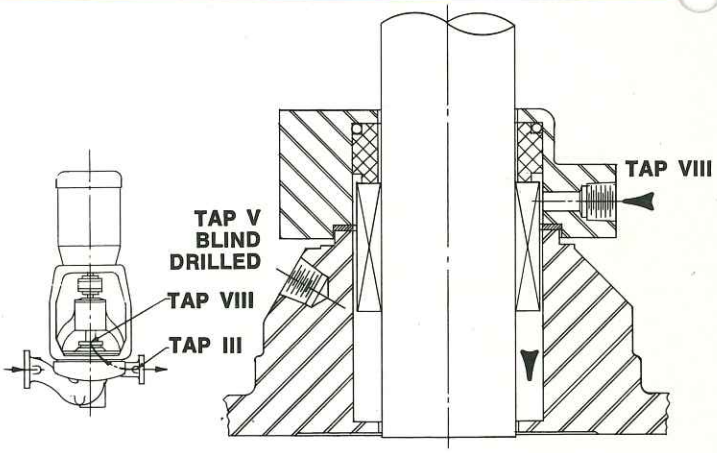
The following stuffing box arrangements are numbered for your convenience to aid in specification and installation.



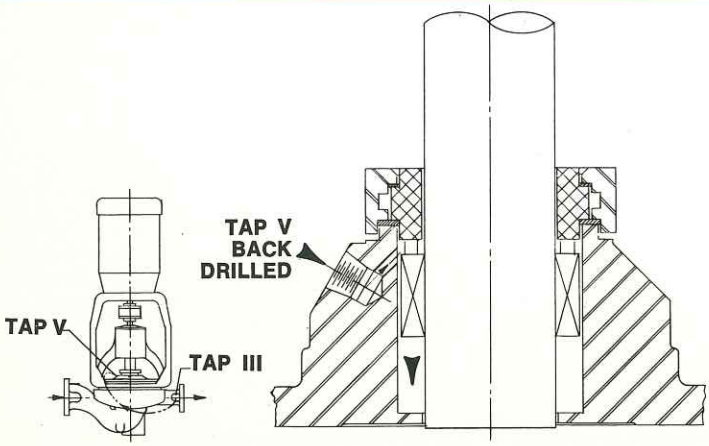
NUMBER 1—Packed Pump, Lubrication by Customer



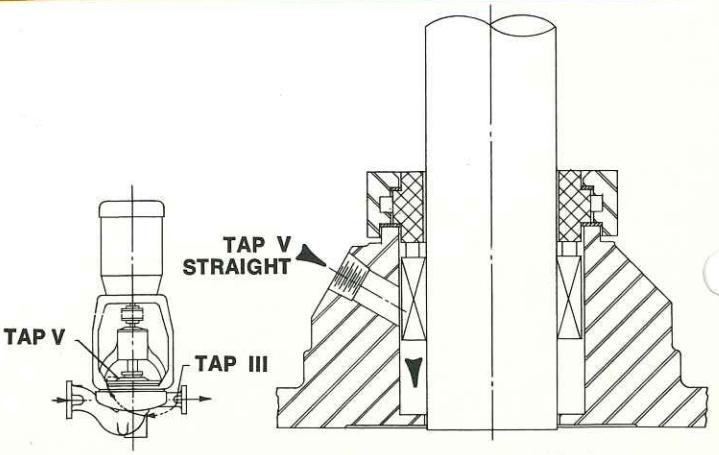
NUMBER 2—Single Inside Seal, Clamped Seat



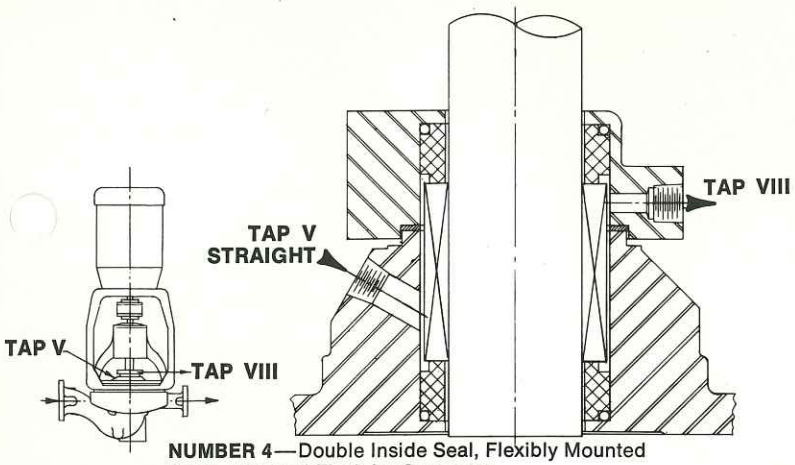
NUMBER 3—Single Inside Seal, Flexible Mounted Seat, Flexible By-Pass Line Tap III to Tap VIII



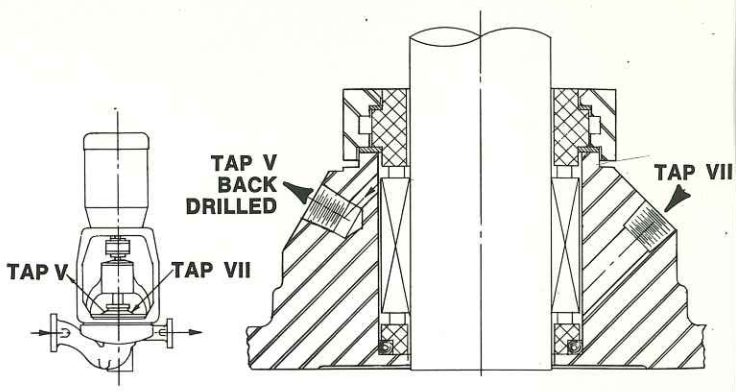
NUMBER 3A—Single Inside Seal, Clamped Seat, Flexible By-Pass Line-Top III to Tap V Back Drilled



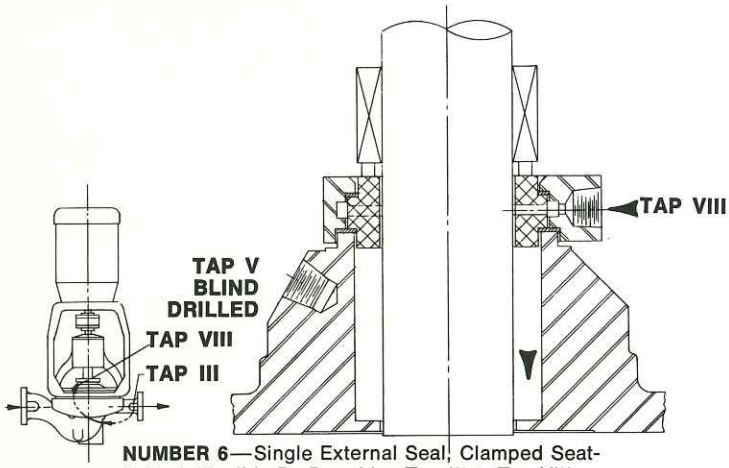
NUMBER 3B—Single Inside Seal, Clamped Seat, Flexible By-Pass Line-Tap III to Tap V Straight



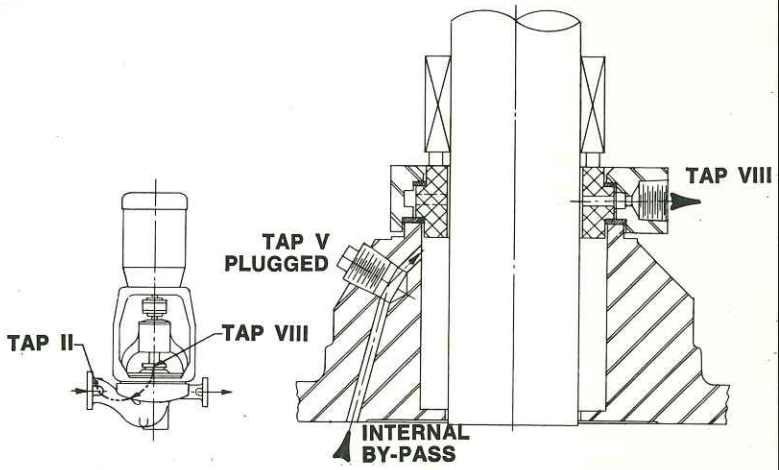
NUMBER 4—Double Inside Seal, Flexibly Mounted Seats, External Flush by Customer



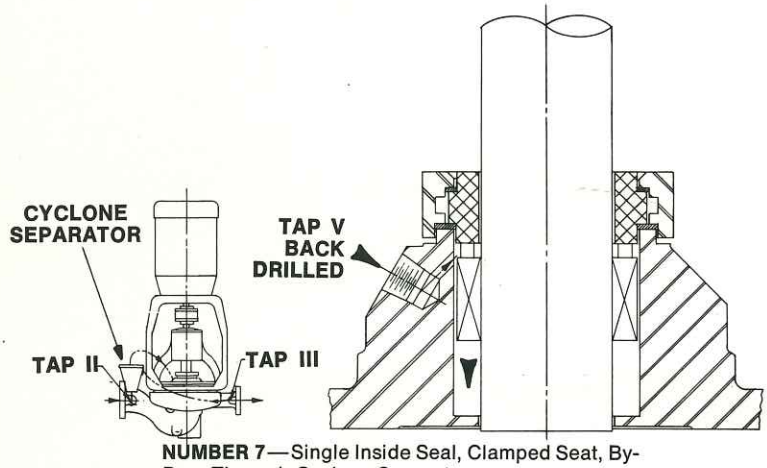
NUMBER 5—Double Inside Seal, Clamped Outer Seat, External Flush by Customer



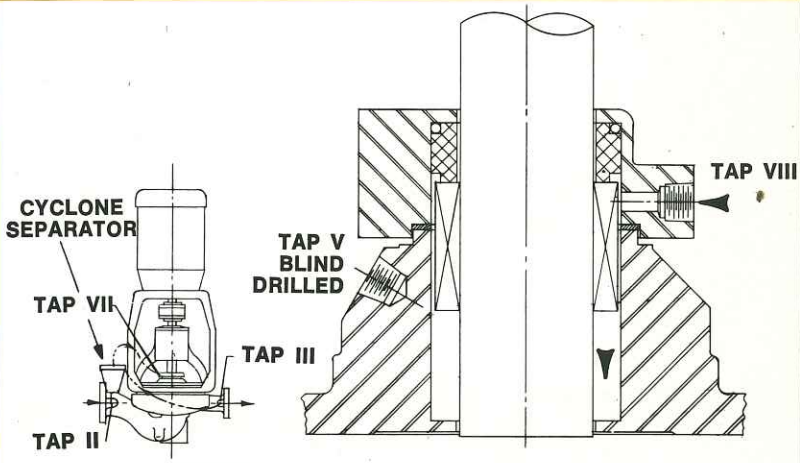
NUMBER 6—Single External Seal, Clamped Seat-Drilled, Flexible By-Pass Line-Tap III to Tap VIII



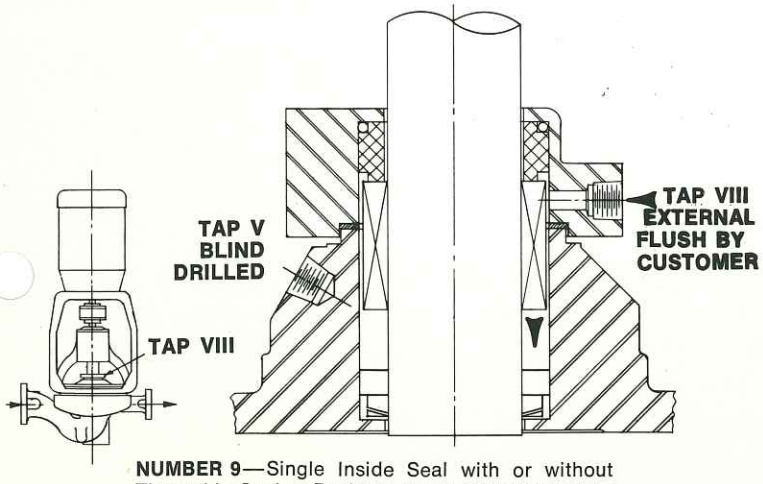
NUMBER 6A—Single External Seal, Clamped Seat-Drilled, Flexible By-Pass Line-Tap VIII to Tap II



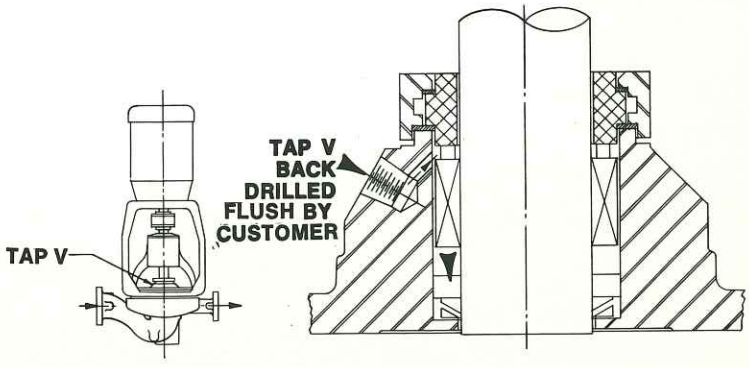
NUMBER 7—Single Inside Seal, Clamped Seat, By-Pass Through Cyclone Separator



NUMBER 8—Single Inside Seal, Flexibly Mounted Seat, By-Pass Through Cyclone Separator

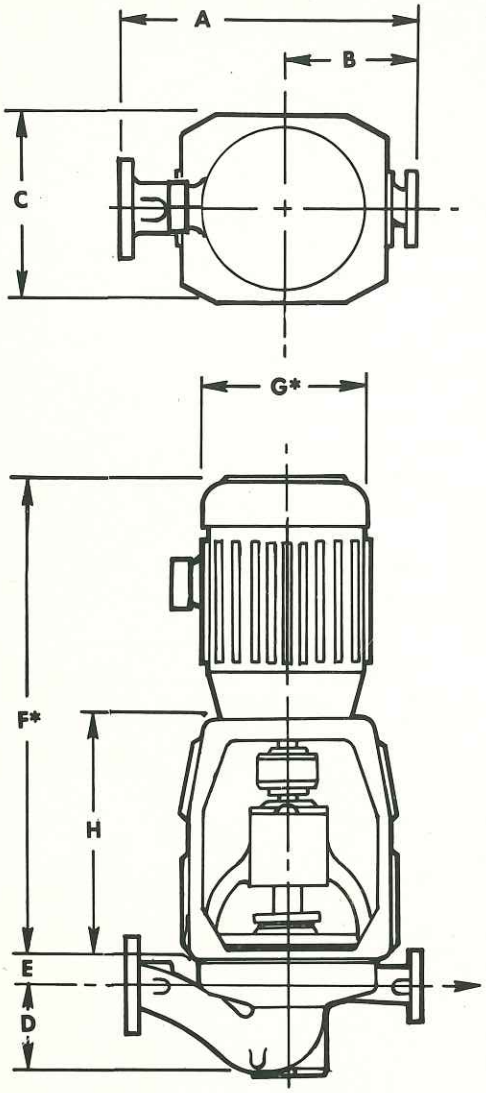


NUMBER 9—Single Inside Seal with or without Throat Lip Seal or Bushing, Flexibly Mounted Seat



NUMBER 10—Single Inside Seal with or without Throat Lip Seal or Bushing, Clamped Seat

DIMENSIONS



*"F" AND "G" DIM. APPROXIMATE

For piping system stress analysis, the DURCO MARK II In-Line Pump Casing may be treated as a spool of schedule 40 pipe with a diameter the size of the pump discharge and a length equal to the face-to-face dimension A.

PUMP DIMENSIONS

PUMP SIZE	Gp.	SUCT.	DSCHG.	WT. lbs.	A	B	C	D	E
2 x 1½V—6	I	2	1½	146	15	7½	13	4⅛	2⅛
2 x 1½V—8	I	2	1½	150	17	9	13	4¼	2⅛
3 x 2V—7	I	3	2	166	17	8	13	4⅞	2⅜
2 x 1½—10	II	2	1½	250	19	9	15⅜	4⅝	2⅛
3 x 2V—10	II	3	2	255	20	9½	15⅜	6⅝2	2⅜
4 x 3V—10	II	4	3	307	25	11½	15⅜	6 15⁄16	2⅜
3 x 2V—13	II	3	2	336	24	11½	18⅜	6⅜	2⅜
4 x 3V—13	II	4	3	377	28	13	18⅜	6 15⁄16	2⅞
6 x 4VA—13	II	6	4	430	30	14	18⅜	7⅞	3⅜

150# FLANGE DRILLING

SIZE	NO.	HOLE	B.C.	O.D.
1½	4	⅝	3⅞	5
2	4	¾	4¾	6
3	4	¾	6	7½
4	8	¾	7½	9
6	8	⅞	9½	11

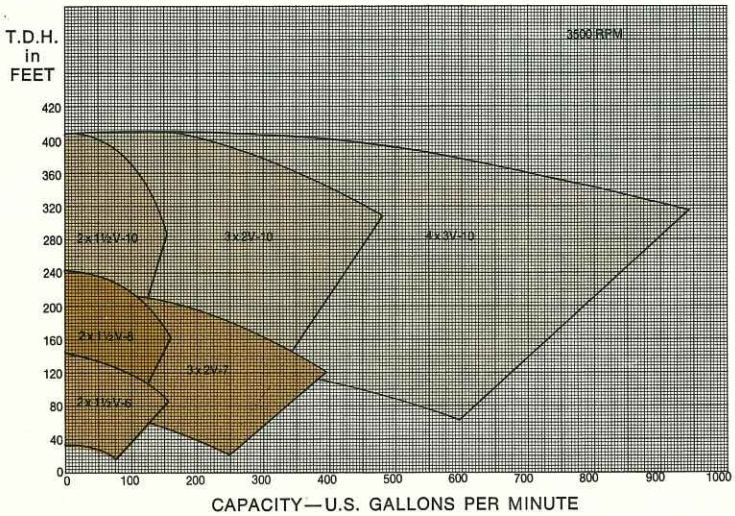
GROUP I MOTOR DATA

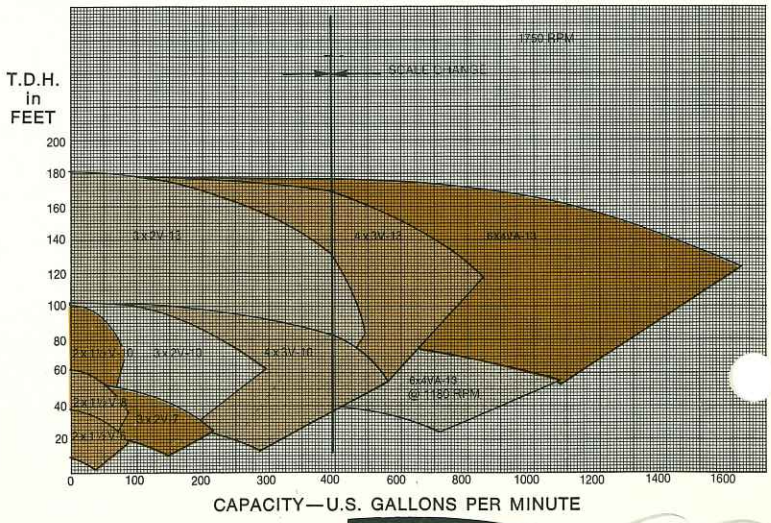
	FRAME →	182 TC	184 TC	213 TC	215 TC	254 TC	256 TC	284 TSC	286 TSC
TOTALLY ENCLOSED EXPLOSION PROOF	HP @ 3600	1.5, 2, 3	5	7.5	10	15	20	25	30
	HP @ 1800	1, 1.5, 2, 3	5	7.5	10	15	20	25	30
	WT. (lbs.)	110	110	185	185	260	260	400	400
	F	32 25⁄32	32 25⁄32	37 3⁄32	37 3⁄32	41 13⁄32	41 13⁄32	43 15⁄16	43 15⁄16
	G	10 11⁄16	10 11⁄16	12 7⁄16	12 7⁄16	14 7⁄16	14 7⁄16	16 9⁄16	16 9⁄16
	H	17 5⁄32	17 5⁄32	18 9⁄32	18 9⁄32	18 9⁄32	18 9⁄32	18 9⁄32	18 9⁄32
DRIP PROOF	HP @ 3600	5	7.5	10	15	20	25	30	40
	HP @ 1800	3	5	7.5	10	15	20	25	30
	WT. (lbs.)	70	70	145	145	305	305	370	370
	F	30 3⁄32	30 3⁄32	34 25⁄32	34 25⁄32	38 23⁄32	38 23⁄32	40⅛	40⅛
	G	10	10	12 7⁄16	12 7⁄16	14 7⁄16	14 7⁄16	16 9⁄16	16 9⁄16
	H	17 5⁄32	17 5⁄32	18 9⁄32	18 9⁄32	18 9⁄32	18 9⁄32	18 9⁄32	18 9⁄32

GROUP II MOTOR DATA

	FRAME →	182 TC	184 TC	213 TC	215 TC	254 TC	256 TC	284 TSC	286 TSC	324 TSC	326 TSC	364 TSC	365 TSC	405 TSC
TOTALLY ENCLOSED EXPLOSION PROOF	HP @ 3600	3	5	7.5	10	15	20	25	30	40	50	60	75	100
	HP @ 1800	3	5	7.5	10	15	20	25	30	40	50	60	75	100
	WT. (lbs.)	110	110	185	185	260	260	400	400	730	730	940	940	1280
	F	35⅛	35⅛	38 13⁄16	38 13⁄16	44	44	43⅛	43⅛	49 1⁄16	49 1⁄16	51½	51½	55 7⁄16
	G	10 11⁄16	10 11⁄16	12 7⁄16	12 7⁄16	14 7⁄16	14 7⁄16	16 9⁄16	16 9⁄16	19 9⁄32	19 9⁄32	22	22	24 5⁄8
	H	20	20	20	20	20 7⁄8	20 7⁄8	20	20	20 7⁄8	20 7⁄8	20 7⁄8	20 7⁄8	20 7⁄8
DRIP PROOF	HP @ 3600	5	7.5	10	15	20	25	30	40	50	60	75	100	
	HP @ 1800	3	5	7.5	10	15	20	25	30	40	50	60	75	
	WT. (lbs.)	70	70	145	145	305	305	370	370	525	525	690	690	
	F	33 1⁄16	33 1⁄16	36½	36½	41 5⁄16	41 5⁄16	41 13⁄16	41 13⁄16	44 5⁄8	44 5⁄8	46	46	
	G	10 11⁄16	10 11⁄16	12 7⁄16	12 7⁄16	14 7⁄16	14 7⁄16	16 9⁄16	16 9⁄16	19 9⁄32	19 9⁄32	22	22	
	H	20	20	20	20	20 7⁄8	20 7⁄8	20	20	20 7⁄8	20 7⁄8	20 7⁄8	20 7⁄8	

COMPOSITE PERFORMANCE CURVES





THE DURIRON COMPANY, INC., DAYTON, OHIO

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